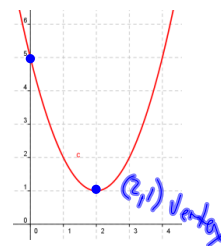


L4 Modelling Quadratics Using Vertex Form

- 1) Sketch the parabola, if possible
- 2) Identify the key properties
- 3) Sub vertex (h, k) into $y = a(x - h)^2 + k$
- if vertex is not given, use symmetry
- 4) Sub any other point to find a
- 5) Does your answer make sense?

Ex.1. Determine the equation in vertex form.



$$\begin{aligned}
 y &= a(x-h)^2 + k \\
 y &= a(x-2)^2 + 1 \\
 \text{Sub } (0, 5) \text{ exact point} \\
 5 &= a(0-2)^2 + 1 \\
 5 &= a(-2)^2 + 1 \\
 5 &= 4a + 1 \\
 5 - 1 &= 4a \\
 4 &= 4a \\
 \frac{4}{4} &= \frac{4a}{4} \\
 a &= 1
 \end{aligned}$$

\therefore the equation is
 $y = (x-2)^2 + 1$

Ex.2 State the equation of the parabola obtained by applying these transformations to the graph of $y = x^2$.

- a vertical stretch by a factor of 5
- a vertical shift up of 9 units

$$\begin{aligned}
 y &= a(x-h)^2 + k \\
 y &= 5(x-0)^2 + 9 \\
 y &= 5x^2 + 9
 \end{aligned}$$

What form is this?
 Standard & Vertex form

Horizontal shift
 \rightarrow doesn't exist.

Ex.3 Write an equation for the parabola that has a vertex at $(-3, 5)$, no zeros, and is wider than $y = x^2$.

$-1 < a < 1$ $a \neq 0$
 Compression

$$\begin{aligned}
 y &= a(x-h)^2 + k \\
 y &= a(x+3)^2 + 5
 \end{aligned}$$

Ex.4 Find the equation of the quadratic that passes through the points $(-3, 2)$, $(5, 2)$ and $(7, 4)$.

$$AOS = \frac{-3+5}{2}$$

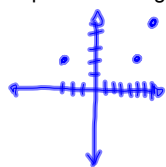
$$X = 1$$

sub(-3,2)

$$y = a(x-1)^2 + k$$

$$2 = a(-3-1)^2 + k$$

$$2 = 16a + k$$



sub(7,4)

$$y = a(x-1)^2 + k$$

$$4 = a(7-1)^2 + k$$

$$4 = 36a + k$$

$$2 = 16a + k \quad \textcircled{1}$$

$$- \quad 4 = 36a + k \quad \textcircled{2}$$

$$\frac{-2}{-20} = \frac{-20a}{-20}$$

$$a = \frac{1}{10}$$

sub $a = \frac{1}{10}$ into ①

$$2 = 16\left(\frac{1}{10}\right) + k$$

$$2 = \frac{16}{10} + k$$

$$\frac{2}{1} - \frac{16}{10} = k$$

$$\frac{20}{10} - \frac{16}{10} = k$$

$$k = \frac{2}{5}$$

\therefore the equation is $y = \frac{1}{10}(x-1)^2 + \frac{2}{5}$

Assigned Work: p. 280 # 1, 2ace, 3ace, 4, 5ace, 6cd, 7b, 8 (w/ diagram), 10, 15